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# BULLETIN OF THE UNIVERSITY OF NEW HAMPSHIRE

Graduate School Number



Vol. XXIV, No. 8

APRIL

Durham

University of New Hampshire

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## BULLETIN OF THE UNIVERSITY OF NEW HAMPSHIRE

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The Bulletin is published in September, October, November, December, January, February, March and April, and includes:

- The Catalog of the University
- The Report of the President
- The Financial Report
- The Catalog of the Summer School
- The Illustrated Booklet
- The Catalog of the Graduate School

and other publications of the University.

# UNIVERSITY CALENDAR

1933-1934

## SUMMER SESSION

July 3	Monday	Registration Day
July 5	Wednesday	Classes begin at 8 A. M.
Aug. 11	Friday	Summer Session closes at 4 P. M.

## FALL TERM

1933

Sept. 12	Tuesday	Matriculation Day—Freshman Class
Sept. 18	Monday	Registration Day—All Classes
Sept. 19	Tuesday	Recitations begin at 8 A. M.
Sept. 20	Wednesday	University Day—Afternoon holiday
Oct. 7	Saturday	Dads' Day
Oct. 20	Friday	Annual Meeting of Board of Trustees
Oct. 27	Friday	Mid-Term warnings to be filed, 5 P. M.
Nov. 4	Saturday	Home-coming Day
Nov. 29	Wednesday	Thanksgiving recess—Wed., 12:30 P.M. to Fri., 8 A.M.
Dec. 11-15	Mon.-Fri.	Fall Term examinations
Dec. 15	Friday	Fall Term closes at 4 P.M.

## WINTER TERM

1934

Jan. 2	Tuesday	Registration Day
Jan. 3	Wednesday	Classes begin at 8 A.M.
Jan. 19	Friday	Meeting of Board of Trustees
Jan. —	Fri., Sat.	Winter Carnival, Fri., 12:30 P.M. to Sat., 12:30 P.M.
Feb. 7	Wednesday	Mid-Term warnings to be filed, 5 P.M.
Mar. 13	Tuesday	Town Meeting
Mar. 12-16	Mon.-Fri.	Winter Term examinations
Mar. 16	Friday	Winter Term closes at 4 P.M.

# UNIVERSITY OF NEW HAMPSHIRE

## SPRING TERM

1934

Mar. 26	Monday	Registration Day
Mar. 27	Tuesday	Recitations begin at 8 A.M.
Apr. 20	Friday	Meeting of Board of Trustees
May 1	Tuesday	Mid-Term Warnings to be filed, 5 P.M.
May 12	Saturday	Mothers' Day
May 30	Wednesday	Memorial Day—Holiday
June 11-15	Mon.-Fri.	Spring Term examinations
June 12	Tuesday	Senior examinations close at 12:30 P.M.
June 16	Saturday	Class Day—Alumni Day—Meeting of Board of Trustees
June 17	Sunday	Baccalaureate Day
June 18	Monday	Commencement Day

## BOARD OF TRUSTEES

HIS EXCELLENCY, GOVERNOR JOHN G. WINANT, A.M., LL.D.,  
*ex officio*

PRESIDENT EDWARD M. LEWIS, A.M., LITT.D., LL.D., *ex officio*

ANDREW L. FELKER, Commissioner of Agriculture, *ex officio*

ROY D. HUNTER, *President* West Claremont  
June 14, 1916 to June 30, 1933

HARRY D. SAWYER Woodstock  
September 15, 1926 to June 30, 1934

JAMES A. WELLMAN, B.S. Manchester  
January 26, 1928 to June 30, 1935

ROBERT T. KINGSBURY Keene  
January 27, 1928 to June 30, 1936

JOHN W. PEARSON, A.B. Concord  
January 26, 1928 to June 30, 1936

ALBERTUS T. DUDLEY, A.B., *Secretary* Exeter  
June 14, 1928 to June 30, 1933

\*CHARLES H. HOOD, B.S., D.S.C. Boston, Massachusetts  
May 6, 1929 to June 30, 1935

GEORGE T. HUGHES, A.M., LL.D. Dover  
July 1, 1931 to June 30, 1935

\*JOHN S. ELLIOTT, B.S. Madbury  
July 1, 1932 to June 30, 1936

JESSIE DOE Rollinsford  
July 1, 1932 to June 30, 1934

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\*Elected by Alumni.

## OFFICERS OF ADMINISTRATION

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HERMON L. SLOBIN, PH.D., *Dean of the Graduate School*  
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ALFRED E. RICHARDS, PH.D., *Secretary*  
JUSTIN O. WELLMAN, M.A., ED.M., PED.D.

## THE GRADUATE FACULTY

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C. FLOYD JACKSON, M.S., *Zoölogy*  
WALTER C. O'KANE, A.M., D.SC., *Entomology*  
ALFRED E. RICHARDS, PH.D., *English*  
ORMOND R. BUTLER, PH.D., *Botany*  
HERMON L. SLOBIN, PH.D., *Mathematics*  
HARRY W. SMITH, A.M., *Economics*  
ALBERT N. FRENCH, M.A., *Sociology*  
GEORGE F. POTTER, PH.D., *Horticulture*  
THOMAS G. PHILLIPS, PH.D., *Agricultural and Biological Chemistry*

## GRADUATE SCHOOL

DONALD C. BABCOCK, S.T.B., A.M., *History*  
HERBERT F. RUDD, PH.D., *Philosophy and Psychology*  
JUSTIN O. WELLMAN, A.M., ED.M., PED.D., *Education*  
HAROLD H. SCUDDER, B.S., *English*  
HAROLD A. IDDLER, PH.D., *Chemistry*  
CLIFFORD S. PARKER, PH.D., *Languages*

## ASSOCIATE PROFESSORS

JAMES H. MARCEAU, A.B., *Languages*  
WILLIAM G. HENNESSY, A.M., *English*  
THORSTEN V. KALIJARVI, M.A., *Political Science*  
ADOLPH G. EKDAHL, PH.D., *Psychology and Education*  
ALMA D. JACKSON, M.A., *Zoölogy*  
JOHN S. WALSH, A.M., *Languages*  
HARLAN M. BISBEE, A.M., *Education*  
J. RAYMOND HEPLER, M.S., *Horticulture*  
WALTER E. WILBUR, M.S., *Mathematics*

## ASSISTANT PROFESSORS

ARTHUR M. JONES, M.A., *History*  
HEMAN C. FOGG, PH.D., *Chemistry*  
MARIAN E. MILLS, M.A., *Botany*  
STANLEY R. SHIMER, M.S., *Agricultural and Biological Chemistry*  
L. PHELPS LATIMER, PH.D., *Horticulture*  
EDYTHE T. RICHARDSON, M.S., *Zoölogy*  
ALLAN B. PARTRIDGE, M.A., *History*  
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PAUL P. GRIGAUT, CERT. SORBONNE, DIPL. ECOLE DU LOUVRE,  
*Languages*  
PAUL S. SCHOEDINGER, M.A., *English*  
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CHARLES M. MASON, PH.D., *Chemistry*  
WILLIAM YALE, PH.B., M.A., *History*

# UNIVERSITY OF NEW HAMPSHIRE

## INSTRUCTORS

STUART DUNN, PH.D., *Botany*

CLAIR W. SWONGER, A.M., *Economics*

JOHN C. HERRING, ED.M., *Education*

EARL H. LITTLE, B.S., *Agricultural Education*

JAMES G. CONKLIN, M.S., *Entomology*

CHARLES E. PACKARD, M.S., *Zoölogy*



# THE GRADUATE SCHOOL

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## AIMS

The Graduate School aims to meet the needs of superior students who are preparing to become teachers in colleges or universities, or investigators, and to offer opportunities to qualified students for a more advanced training than they can obtain in an undergraduate curriculum.

## ADMINISTRATION

Graduate work is offered, under the supervision of the Dean of the Graduate School, by competent members of various departments of instruction and research. These members constitute the Faculty of the Graduate School.

The general administrative functions of the Faculty are delegated to the Dean and the Council.

## ADMISSION

A student who holds a bachelor's degree, or its equivalent, from an approved college or university, is eligible for admission to graduate study.

Admission to graduate study does not necessarily imply admission to candidacy for an advanced degree. Students who are not planning to become candidates for an advanced degree may be admitted to graduate study upon the recommendation of the heads of the departments concerned, and with the approval of the Dean.

A student may major only in the departments represented in the catalog of the Graduate School. However, a graduate student who is not a candidate for an advanced degree may be admitted to graduate study in departments not represented in the Graduate School catalog, upon recommendation of the departments concerned and with the approval of the Graduate Council.

# UNIVERSITY OF NEW HAMPSHIRE

## TUITION AND FEES

Tuition is \$150 for residents of New Hampshire and \$250 for non-residents. For non-resident students who entered the University before the end of the college year 1927-28, the tuition is \$225. Tuition is paid in advance in three equal installments, one on the first day of each term.

A diploma fee of \$5 is charged upon graduation. Charges will be assessed for extraordinary breakage or damage. No laboratory or course fees are charged. Payment of the tuition fee entitles the student to admission to all varsity athletic games and contests.

Members of the regular university staff (and their immediate families) registered for 30 or more time units shall be granted scholarships. A scholarship will reduce the tuition charge to \$25 per term. Members of the regular university staff and their immediate families registering for less than 30 time units will be required to pay \$.50 for each time unit.

## HONORARY FELLOWSHIPS FOR VISITING SCHOLARS

Professors or other eminent scholars who may desire temporarily the privileges of the library and the research facilities of the University, and who are not candidates for a degree, may, upon recommendation of the Dean of the Graduate School and the approval of the President of the University, be appointed Honorary Fellows without stipend. Honorary Fellows shall not be required to pay any charges except, possibly, the cost of unusually expensive supplies or equipment.

## ASSISTANTSHIPS AND SCHOLARSHIPS

Graduate assistantships which usually require half-time service at a stated salary are available in a number of departments. Graduate assistants pay tuition in accordance with the regulation pertaining to the members of the University staff. The residence requirement for a Master's degree for holders of these appointments is not less than two years.

A limited number of superior students are awarded exemption from tuition. These awards are subject to the maintenance of a

## GRADUATE SCHOOL

high scholarship record in the Graduate School and may be revoked by the Committee on Exemption of Tuition at the end of any term, if, in their judgment, the student does not merit such exemption for the subsequent terms.

Inquiries regarding these assistantships and scholarships should be addressed to the head of the department concerned.

## SUPPLIES

Books, drawing instruments, materials, etc., may be purchased at the University Bookstore in Thompson Hall.

## ROOMS

Because of the congestion of undergraduate students in the dormitories of the University, it is impossible to guarantee reservation of rooms to graduate students. Rooms may be secured in private houses at prices ranging from \$85 to \$150 per year.

Women students, unless living at home, are required to room in the women's dormitories, or in approved houses. A competent matron is in charge of each women's dormitory.

## BOARD

The University operates on a self-service basis a modern, well-appointed Commons. Both regular weekly board and cafeteria service are provided. Exact cost records are kept, and prices are adjusted in such a manner as to give students the advantage of changing costs.

## REGISTRATION

A student desiring to register for graduate study must submit to the Dean of the Graduate School the official application for admission to graduate study. Blanks for this purpose may be obtained from the Dean of the Graduate School.

Upon admission to graduate work, a student first pays his fee at the Business Office and deposits his enrollment cards with the Registrar.

## UNIVERSITY OF NEW HAMPSHIRE

### REQUIREMENTS FOR GRADUATE CREDIT

Graduate credit will not be allowed to undergraduate students unless such credit has been approved in advance by the Dean of the Graduate School.

A student will not receive graduate credit for a course in which he has obtained a grade lower than 70.

### ADVANCED DEGREES

Two types of advanced degrees are conferred: (a) Master of Science, Master of Arts and Master of Education given only in course and (b) the professional degrees, Mechanical Engineer, Electrical Engineer and Civil Engineer conferred only upon graduates of this institution, and based upon the quality of their professional work and the presentation of a satisfactory thesis. Information in regard to the professional degrees may be obtained from the Dean of the College of Technology.

### REQUIREMENTS FOR THE MASTER'S DEGREE

**Residence.**—A minimum of one full academic year, or four summer sessions, in residence, is required.

**Credits.**—An average grade of at least 80 in not less than 45 credit hours is required, of which not less than 25 or more than 30 credit hours shall be devoted to the major course (including the thesis), and not less than 9 or more than 15 credit hours to the minor courses. Work in allied departments may be properly correlated with the major course. Not over 15 credits may be given for a thesis. Of the total credits required for an advanced degree, not more than half will be accepted on admission from another institution.

**Candidacy.**—At least six months previous to the time the degree is sought an application for admittance to candidacy must be submitted to the Council for their approval; and if a thesis is required, the candidate must file with the Council, for their approval, a statement of the thesis subject as recommended by the head of the department in which the thesis work has been done.

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**Thesis.**—All theses must be typewritten upon standard paper, eight and one-half by eleven inches, medium weight, neatly bound in black cloth, and gilt-lettered on the first cover with the title, name of author, degree sought, and year of graduation. The title page should bear the following statement:

“A thesis submitted to the University of New Hampshire in partial fulfillment of the requirements for the degree of Master of Arts (Master of Science, Master of Education) in (name of ‘major’ subject).”

Whenever a thesis is printed in any periodical, it must be designated as having been accepted as a Master’s thesis by the University of New Hampshire.

Two bound copies must be filed before Commencement Day, one with the Librarian and one with the head of the department in which the major work has been done.

**Examinations.**—All candidates must meet the regular departmental requirements as to examinations in the courses for which they are registered, and the requirement of a special comprehensive examination, by the heads of the departments in which the major and minor courses have been taken, three months previous to the time the degree is sought. In addition, the candidate must pass an oral examination by a special committee designated by the Council and including the heads of the departments in which the major and minor courses have been taken, before the candidate may be recommended for the Master’s degree.

For detailed information concerning graduate study see catalog of the Graduate School.

# DESCRIPTION OF COURSES

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## AGRICULTURAL AND BIOLOGICAL CHEMISTRY

THOMAS G. PHILLIPS, *Professor*

STANLEY R. SHIMER, *Assistant Professor*

Students majoring in this department are expected to have had preparation in the biological sciences, in physics and in general, analytical and organic chemistry. Physical chemistry and a reading knowledge of German or French are desirable. The library and equipment of the Experiment Station are available for the use of graduate students.

### COURSES FOR ADVANCED UNDERGRADUATE AND GRADUATE STUDENTS

**4-a. Physiological Chemistry.** An advanced study of the chemistry of the fats, carbohydrates and proteins, and some of the general applications of chemistry to biology, such as colloids and enzyme action.

Prerequisite: Agricultural Chemistry 2-b or 24-b or equivalent preparation in Organic Chemistry and Quantitative Analysis. 3 lectures; 2 laboratories; 5 credits.

**5-b. Physiological Chemistry.** The chemistry of animal physiology, including foods, digestion, metabolism and excretion.

Prerequisites: Agricultural Chemistry 4-a. 3 lectures; 2 laboratories; 5 credits.

**6-b. Plant Chemistry.** A study of the chemistry of plant growth and development, and methods for the analysis of plant materials.

Prerequisite: Agricultural Chemistry 4-a. Given only in alternate years beginning with 1932-33. 2 lectures; 2 laboratories; 4 credits.

## GRADUATE SCHOOL

**7-a, 8-b, 9-c. Agricultural Analysis.** A study of the methods of analysis of fertilizers, feeding-stuffs and other products important in Agriculture.

Prerequisites: At least 15 units in Quantitative Analysis and 20 units in Organic Chemistry. 1 lecture; 3 laboratories; 4 credits.

**21-c. Physiological Chemistry.** The qualitative and quantitative examination of blood and urine.

Prerequisite: Agricultural Chemistry 5-b. 3 lectures; 2 laboratories; 5 credits.

### COURSES PRIMARILY FOR GRADUATE STUDENTS

**10-a, 11-b, 12-c. Advanced Biochemistry.** The preparation, composition and analysis of proteins, carbohydrates and fats. Readings, discussions and laboratory work.

4 credits each.

**13-a, 14-b, 15-c. Special Problems.** Conferences, library and laboratory work on such topics as enzymes, physico-chemical methods, and certain phases of plant or animal nutrition and metabolism. Subject matter and credits to be arranged.

**16-a, 17-b, 18-c. Seminar.**

1 credit each.

## BOTANY

O. R. BUTLER, *Professor*

MARIAN E. MILLS, *Assistant Professor*

STUART DUNN, *Instructor*

MAJOR: Students majoring in Botany must have fulfilled undergraduate major requirements or their equivalent.

MINOR: Students taking a minor in Botany must have had at least 12 credits in Botany and 12 credits in Chemistry.

**20-a. Morphology of the Algae.** Study of the habits, structure, life histories and relationships of the various groups of the algae.

Lab. and assigned reading, 4 credits. Given in alternate years with 24-a.

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### **21-a and -b. Morphology of the Bryophytes and Pteridophytes.**

Study of the structures, life histories and relationships of the liverworts, mosses, ferns and fern allies.

Lab. and assigned reading, 4 credits.

**22-c. Morphology of Gymnosperms.** Study of the structure, life histories, relationships and classification of gymnospermous plants.

Prerequisite: Botany 26-a. Lab. and assigned reading, 4 credits.  
Given in alternate years with 23-c.

**23-c. Morphology of Angiosperms.** Study of the structures, life histories and classification of the flowering plants.

Prerequisite: Botany 26-a. Lab. and assigned reading, 4 credits.  
Given in alternate years with 22-c.

**24-a. Plant Ecology.** A study of the external factors affecting the plants' economy, structure, duration of life and topographical distribution of species; plant communities, plant associations, and plant succession.

Prerequisite: Botany 25-c. Conferences, assigned reading and reports; 2 credits. Given in alternate years with 20-a.

**25-c. Systematic Botany.** A study of the higher plants of our native flora. The student is required to prepare an herbarium of 90 plants.

Prerequisite: Botany 1-a, 2-b, 3-c. Conferences, field and laboratory work; 4 credits.

**26-a. Plant Histology.** General morphology of the tissue systems; the primary tegumentary tissue; the fundamental tissue system, the vascular tissue system, development of secondary members, formation of secondary tissue.

Prerequisite: Botany 6-a. Lab. and assigned reading; 5 credits.

**27-a. Plant Physiology.** A study of imbibition, osmosis, absorption, conduction, transpiration, guttation and the effect of environmental factors upon these phenomena; water relations of plants.

Prerequisite: Botany 5-c. Lab. and assigned reading; 5 credits.



## GRADUATE SCHOOL

**28-b. Plant Physiology.** A study of mineral nutrition, photosynthesis, physical and chemical properties of chlorophyll, effect of external and internal conditions on carbon dioxide assimilation, products of assimilation, photoperiodism.

Prerequisite: Botany 5-c. Lab. and assigned reading; 5 credits.

**29-c. Plant Physiology.** Digestion of carbohydrates and fats, hydrolysing enzymes, respiration, oxidising enzymes, intramolecular respiration, digestion of proteids, proteolytic enzymes, effect of external conditions on growth, paratonic and autonomous movements.

Prerequisite: Botany 5-c. Lab. and assigned reading; 5 credits.

**30-a, -b, -c. Literature of Plant Physiology.** Assigned reading of monographs and other important literature of plant physiology.

Prerequisite: Botany 5-c. Conferences and written reports. Credits to be arranged.

**31-a, -b. Diseases of Fruits.** The bacterial and fungous diseases of fruits, their symptoms, cause and prevention.

Prerequisite: Botany 13-b. Lab. and assigned reading; 3 credits.  
Given in alternate years with 32-a, -b.

**32-a, -b. Diseases of Vegetables.** The bacterial and fungous diseases of vegetables, their symptoms, cause and prevention.

Prerequisite: Botany 13-b. Lab. and assigned reading; 3 credits.  
Given in alternate years with 31-a, -b.

**33-b. Fungicides.** Preparation and use of fungicides and a study of their effect upon the higher plants and parasitic organisms.

Prerequisite: Botany 13-b. Lab. and assigned reading; 4 credits.

**34-a. Mycology.** Morphology, physiology and classification of the Schizomycetes, Myxomycetes, and Phycomycetes.

Lab. and assigned reading; 4 credits.

**35-b. Mycology.** Morphology, physiology and classification of the Ascomycetes, Basidiomycetes and Fungi imperfecti.

Lab. and assigned reading; 4 credits.

# UNIVERSITY OF NEW HAMPSHIRE

## CHEMISTRY

HAROLD A. IDDLER, *Professor*

HEMAN C. FOGG, *Assistant Professor*

JAMES A. FUNKHOUSER, *Assistant Professor*

RICHARD H. KIMBALL, *Assistant Professor*

CHARLES M. MASON, *Assistant Professor*

Graduate study in chemistry is open to those who have completed the chemistry curriculum of either the College of Liberal Arts or the College of Technology, or some similar course of study. Excellent opportunities are offered for research in General and Analytical Chemistry, Organic Chemistry and Physical Chemistry.

### COURSES FOR ADVANCED UNDERGRADUATES AND GRADUATES

**40-a, 41-b, 42-c. Organic Chemistry.** The lectures deal with the principal classes of organic compounds, aliphatic and aromatic, with emphasis upon class reactions and structural theory. In the laboratory, the preparation and purification of a selected number of organic compounds is carried on. Professor Iddles and Assistant Professor Kimball.

Prerequisite: Inorganic and Analytical Chemistry. 3 lectures, 3 credits; 2 laboratories, 2 credits. May be taken for graduate credit by others than majors in chemistry.

**100-a, 101-b. Advanced Inorganic Chemistry.** A course of study of the elements from the standpoint of the periodic law. Topics stressed in addition to the rarer elements are atomic structure, radioactivity, Werner's theory of complex compounds. Assistant Professor Funkhouser.

Prerequisite: Inorganic and Analytical Chemistry. 3 lectures, 3 credits; 2 laboratories, 2 credits.

**152-a, 153-b, 154-c. Advanced Organic Chemistry.** A consideration of the more advanced theories of organic chemistry. Assistant Professor Kimball.

Prerequisite: Elementary Organic Chemistry. 3 lectures; 3 credits.

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**160-c. Introductory Physical Chemistry.** This course will take up the general principles of chemistry from the exact quantitative standpoint. It will include a comprehensive study of molecular weights, solids, liquids, gases and colloids. A large number of problems will be assigned for solution by the student. Assistant Professor Mason.

Prerequisite: Chemistry 31-b, Math. 9-c, Physics 8-c. 3 lectures; 3 credits.

**161-a, 162-b, 163-c. Physical Chemistry.** (continuation of 160-c). The principles of thermo-dynamics will be presented and their application to chemistry discussed. This will be used as a basis for the study of solutions, ionic theory, chemical equilibria, thermo-chemistry, conductance, electromotive force, etc. The experiments in the laboratory will include quantitative measurements illustrating the principles studied in the lectures. A large number of problems will be assigned for solution by the student. Assistant Professor Mason.

Prerequisite: Chemistry 160-c. 3 lectures; 2 laboratories; 5 credits.

### COURSES PRIMARILY FOR GRADUATE STUDENTS

**200-a. Chemistry of the Rarer Elements.** Lectures, recitations and reference assignments are chosen to give an introduction to the history, occurrence, extraction, properties and uses of the more uncommon elements and rare earths. Assistant Professor Fogg.

Lectures 2 hours; 3 credits. (Formerly given as 201-b, 202-c.)

**201-b. Advanced Physical Chemistry.** Special topics in Physical Chemistry. Assistant Professor Mason.

Prerequisite: Chemistry 163-c or equivalent. Lectures and discussions 2 hours; 3 credits. Given in alternate years. Given in 1933-34.

**202-c. History of Chemistry.** A course tracing the growth of chemistry, particularly theories of the science in a historical manner. The course also endeavors to give an insight into the personalities of famous chemists and lays some stress on the better known contemporary chemists and their work. Assistant Professor Funkhouser.

Prerequisite: Acceptable courses in organic chemistry. 3 lectures; 3 credits. Given in alternate years. Given in 1933-34. (Formerly given as 200-a.)

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**206-a. Advanced Quantitative Analysis; Physico-chemical Methods.** The lectures, recitations and laboratory work include analytical procedures involving nephelometry, colorimetry, electro-metric titrations, etc. The subjects of buffers, methods of determining pH, use and theory of electrodes for E.M.F. measurements, and electrolytic separations by controlled electrode potential and internal electrolysis are studied. Assigned readings are made to recent publications concerning these and other analytical topics. Assistant Professor Fogg.

2 lectures, 3 credits; 2 laboratories, 2 credits. Given in alternate years. Given in 1933-34.

**207-b, 208-c. Advanced Quantitative Analysis.** This is a course covering analyses designed to fit the needs and desires of the students electing it. Advanced gravimetric and volumetric analysis, including applications of recently published work pertaining to quantitative will be presented. Qualitative analysis pertaining to the rarer elements may be substituted. Students electing this course will find it advantageous to have taken Chemistry 206-a. Assistant Professor Fogg.

3 laboratories; 3 credits.

**249-a. Organic Chemistry Laboratory: Preparations.** Advanced organic synthesis, involving special training in organic laboratory technique. Professor Iddles.

3 laboratories; 3 credits. Given in alternate years. Given in 1934-35.

**250-b. Organic Chemistry Laboratory-Qualitative Analysis.** The reactions and properties of organic compounds. Use of group reactions in the identification of organic substances. Professor Iddles.

3 laboratories; 3 credits. Given in alternate years. Given in 1934-35.

**251-c. Organic Chemistry Laboratory-Quantitative Analysis.** The combustion for carbon and hydrogen, Dumas nitrogen, Kjeldahl nitrogen, estimation of halogens, of sulphur and of organic radicals. The work will include some micro-determinations. Professor Iddles.

3 laboratories; 3 credits. Given in alternate years. Given in 1934-35.

## GRADUATE SCHOOL

**252-a. Organic Chemistry.** The chemistry of the Polynuclear Compounds and Heterocycles. Professor Iddles.

2 lectures; 3 credits. Given in alternate years. Given in 1933-34.

**253-b. Organic Chemistry.** Carbohydrates. Professor Iddles.

2 lectures; 3 credits. Given in alternate years. Given in 1933-34.

**254-c. Organic Chemistry.** Special topics and theories of organic chemistry. Professor Iddles.

2 lectures; 3 credits. Given in alternate years. Given in 1933-34.

**260-a, 261-b, 262-c. Chemical Thermodynamics.** The application of thermodynamics to chemistry. The principles of thermodynamics will be thoroughly reviewed. These principles will be applied in detail to the phase rule, chemical equilibrium, electromotive force, theory of solutions, specific heats and similar topics. Assistant Professor Mason.

Prerequisite: Chemistry 163-c or its equivalent. 2 lectures; 3 credits.

Given in alternate years. Given in 1934-35.

**270-a, 271-b, 272-c. Seminar.** Presentation and discussion of recent investigations in the field of chemistry.

1 lecture; 1 credit.

**280-a, 281-b, 282-c.** Research for the Master's Degree. Credit arranged.

## EDUCATION AND PSYCHOLOGY

JUSTIN O. WELLMAN, *Professor*

HARLAN M. BISBEE, *Associate Professor*

ADOLPH G. EKDAHL, *Associate Professor*

NAOMI M. G. EKDAHL, *Assistant Professor*

JOHN C. HERRING, *Instructor*

\*EARL H. LITTLE, *Instructor in Agricultural Education*

### Education

The objectives for graduate students in Education are a sound educational philosophy, expertness in research, and technical efficiency in administration and supervision.

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\*Representing the State Department of Education in the administration of the Smith-Hughes Act.

## UNIVERSITY OF NEW HAMPSHIRE

Students whose undergraduate records or whose technical experiences are prognostic of success in attaining the above objectives will be admitted to graduate study in Education.

Candidates for a Master's degree must present, in addition to a Bachelor's degree, 18 credits in Education from the following courses, or their equivalents: Education 21-a, 22-b, 23-c, 31-a, 32-b, 33-c, 38-a, 39-b, 40-c, 41-a-b-c, and 44-c. One year of successful teaching experience will be considered to be equivalent to Education 41-a-b-c.

Candidates will be counselled to project a year of work which will permit concentration in: (1) Educational Psychology, or (2) Educational Philosophy, or (3) Administration and Supervision, or (4) Teaching Technique.

**31-a. Psychology of Childhood.** An intensive study of the development of the mind from childhood to adolescence. A careful interpretation of the development of the individual's mental processes with a view to proper methods of education is given special attention. Lectures, problems, assigned readings and discussions. Assistant Professor Ekdahl.

Accepted jointly with 32-b or 33-c for State Secondary Certificate.  
3 lectures or recitations; 3 credits.

**32-b. Psychology of Adolescence.** The purpose of this course is to give high school principals and teachers a deeper appreciation of the habitual and impulsive life of boys and girls in their teens. Topics: preadolescence; the physical and mental traits of high school pupils; individual differences among high school pupils and their implications; motor training, gymnastics, athletics, play, sport, and games as they function in the education of the youth; growth of social ideas; adaptation of school work to intellectual development; moral and religious training. Lectures, problems, assigned readings and discussions. Assistant Professor Ekdahl.

Prerequisite: Education 31-a. Accepted jointly with 31-a, for a State Secondary Certificate. 3 lectures or recitations; 3 credits.

**33-c. Psychology of Learning.** This course considers the nature of learning and retention, and their neural bases; learning curves, their uses and significance; forms of learning; motives to learning;

## GRADUATE SCHOOL

factors and conditions affecting the rate and permanency of learning; problems relating to learning capacity; transfer of training, and means of effecting beneficial transfers; applications to practical school work and to the training of persons requiring special treatment. Lectures, assigned readings and discussions. Assistant Professor Ekdahl.

Prerequisite: Education 32-b. Accepted jointly with 31-a, for the State Secondary Certificate. 3 lectures or recitations; 3 credits.

**35-a. Measurements and Statistics.** This course deals with the principles, methods and application of various types of scales for measuring general mental ability and educational achievement. It includes a brief survey of statistical methods essential to an understanding of testing. Sufficient practice in giving tests is provided to give the student an appreciation of psychological methods of procedure. Assistant Professor Ekdahl.

3 lectures or recitations; 3 credits.

**36-b. The Measurement of Achievement.** This course will furnish an opportunity to study the results of education as measured by evidences that children are learning. Some of the topics discussed are: school marks; the development of standard tests; the study of diagnostic and prognostic tests; the interpretation of the results of achievement tests; how to develop scales in various secondary school subjects; the effects of measurements on examinations, scholarship marks, methods, supervision, courses and the like. Lectures, assigned readings, problems, and discussions. Assistant Professor Ekdahl.

Prerequisite: Education 35-a. 3 lectures or recitations; 3 credits.

**37-c. Measurement of Aptitudes and Mental Alertness.** This course will concern itself with the problem of analyzing various types of intelligence. It deals with the chief facts of normal, mental, physiological, and anatomical development as a basis for differentiation in classroom procedure. Some attention will be given to the problem of adjustment among super-normal and sub-normal pupils. A technique of the administration of group and individual tests is studied and emphasis is laid upon performance tests. Lectures, assigned readings, problems, and discussions. Assistant Professor Ekdahl.

Prerequisite: Education 36-b. 3 lectures or recitations; 3 credits.



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### **38-a. Secondary Education in the Junior High School.**

The evolution of the junior high school; its particular features and functions; the attempt to humanize the education of adolescents and advance the cause of democracy are some of the topics discussed. Considerable attention is given to the program of studies for and administration of junior high schools. Consideration is given in this course to extra-classroom activities and their articulation with classroom procedures. Lectures, assigned readings, problems, discussions. Professor Wellman and Associate Professor Bisbee.

3 lectures or recitations; 3 credits.

**39-b. Secondary Education.** Evolution of secondary schools, their articulation with elementary schools, colleges, technical institutes, vocations, and the home; teaching staff; curriculum; student organizations; life guidance; aims and values of the various high school subjects; extra-curricular activities. Lectures, assigned readings, problems and discussions. Professor Wellman and Associate Professor Bisbee.

Prerequisite: Education 38-a. Accepted for State Secondary Certificate. 3 lectures or recitations; 3 credits.

**40-c. Classroom Methods.** A consideration of the purposes of high school instruction; selection and arrangement of subject matter; types of learning involved in high school subjects; the place of practice or drill; the significance of reflective thinking and correct habit formation; the art of questioning; directed study; the measurement of the results of teaching. Lectures, assigned readings, problems and discussions. Professor Wellman and Associate Professor Bisbee.

Prerequisite: Education 39-b. Accepted for a State Secondary Certificate. 3 lectures or recitations; 3 credits.

**40.4-a. The Teaching of History in Secondary Schools.**  
Professor Wellman.

3 lectures or recitations; 3 credits.

**40.7-b. The Teaching of Science in Secondary Schools.**  
Professor Wellman.

3 lectures or recitations; 3 credits.



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**42-a. History and Principles of Vocational Education.** The historical development of vocational education. The psychological and sociological bases of vocational education; problems, institutions, methods, contemporary movements and legislation; applications of research in relating vocations and education. Lectures, assigned readings and discussions. Mr. Herring.

3 lectures or recitations; 3 credits.

**43-b. Mental Hygiene.** This course will consider some of the more important chapters in modern school hygiene; conditions that determine growth and development, physiological age, the physical and mental differences between children and adults, the general principles of somatic and mental hygiene, tests of ability to work and physical condition, medical inspection, the development of habits of healthful mental activity and the hygienic aspects of various school exercises. Lectures, assigned readings, cases and discussions. Assistant Professor Ekdahl.

Prerequisite: Education 31-a. 3 lectures or recitations; 3 credits.

**45-a. School Administration.** A subject in the fundamental principles of school administration intended primarily for superintendents, and for those who are preparing to become superintendents or supervisors, or directors of educational research. Topics: principles of scientific management applied to school administration; school records and reports; problems of school finance; judging school buildings; special schools; special phases of school work as health education, compulsory attendance; the training of school superintendents and supervisors; the uses of school surveys; the publicity work of a school system. Reference reports on special topics and discussions. Associate Professor Bisbee.

Open especially to men and women with teaching experience, or to those who have had several Education courses and wish to prepare themselves for supervisory positions. Admission by consent of the instructor. 3 lectures or recitations; 3 credits.

**46-b. High School Administration.** The following topics will be covered: the legal status of the secondary high school; high school population; the problem of reorganization; the program of studies;

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vocational education and guidance in the high school; grading, measurement, classification, excess credit for quality; enrolling the student; social organization; community relationships; the high school library, staff, buildings, costs and efficiency, in general. Lectures, assigned readings and discussions. Associate Professor Bisbee.

Open especially to both men and women who wish to become principals or headmasters. Admission by consent of the instructor. 3 lectures or recitations; 3 credits.

**47-c. Principles of Education.** Selected biological, psychological, sociological and statistical material will be treated in such way as to give the student not only a survey of the fundamental principles of education, but also a good basis for more intensive courses in education. Educational theory stressing the more important principles involved in the process of education especially in the secondary schools. Lectures, assigned readings and discussions. Associate Professor Bisbee.

Open to men and women who wish to become administrators or supervisors. Admission by consent of instructor. 3 lectures or recitations; 3 credits.

**48-b. Agriculture in the High School.** This subject deals with special methods of teaching agriculture in the high school, with emphasis upon New Hampshire requirements as set up by the State Board of Education. The chief topics considered are: planning and equipping of classrooms and shops, selection of reference books, use and construction of charts and illustrative materials, the curriculum, the yearly plan of work; the presentation of materials of instruction through recitation, laboratory, field work and excursions; teaching through the home project, and supervised study. Mr. Little.

3 lectures or recitations; 3 credits.

**52-a. Educational Problems.** (Democracy in Education and Character Development.) This course will discuss student participation in high school control; social functions, their nature, supervision, time, and place. The underlying principles of club work, together with a discussion of organization and administration of typical clubs of senior high schools, will be given careful attention. The problem of character education and a discussion of the moral

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standards in our high schools as revealed by investigations will furnish the student with concrete evidence in this interesting field. Lectures, assigned readings, problems, and problems of research. Associate Professor Bisbee.

3 lectures or recitations; 3 credits.

**53-b. Educational Problems.** (Educational and Vocational Guidance.) This course endeavors to make clear the problems with which the school counselor, the employment manager, and the intelligent individual himself have to deal. It discusses the beginnings of the guidance, pseudo-guidance, counselors' work in junior and senior high schools, and shows the intelligent student how he may guide himself, the methods of securing a position and obtaining advancement. Lectures, assigned readings, projects, problems, case studies with special reports. Professor Wellman.

3 lectures or recitations; 3 credits.

**54-c. Educational Problems.** (The Psychology of Management.) This course is designed to help those who are concerned with administration and supervision, whether in the teaching profession or in any business occupation, to establish and maintain that human efficiency which results from high group morale. There will be a discussion of teacher participation through advisory council, shop committee plans, and other means of promoting democracy in the field of management. One-third of the time of this course will be devoted to the consideration of the psychology of camp leadership and special lectures will be introduced through the coöperation of the college Y. M. C. A. and Y. W. C. A. The camp leadership section will be open to all students and will carry one credit. Projects, problems, topical reports and discussions. Mr. Herring.

3 lectures or recitations; 3 credits.

**55-a, 56-b, 57-c. Special Problems in Educational Psychology.** In this course an opportunity is afforded for intensive experimental and statistical work in Educational Psychology. Special problems may be carried over two or more terms.

**101-a, 102-b, 103-c. Research in Administration and Supervision.** To be arranged.

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## PSYCHOLOGY

**37-a. Experimental Psychology.** Simple experiments on the sensations. Emphasis will be given toward the development of the proper technique of psychological investigation.

6 lectures and laboratories; 3 credits.

**38-b. Experimental Psychology.** Experiments on the complex mental processes involving perception, association, imagination, learning and reaction time.

6 lectures and laboratories; 3 credits.

**39-c. Experimental Psychology.** Psychophysical measurements, the determination of Weber constants, limens of sensibility, etc.

6 lectures and laboratories; 3 credits.

**47-a. Physiological Psychology.** A study of the physical basis of mind, nerve functions and their correlations with mental processes.

3 lectures or recitations; 3 credits.

**48-b. Comparative Psychology.** A study of psycho-genesis or the development of "mind" beginning with the one-celled organisms.

3 lectures or recitations; 3 credits.

**49-c. Abnormal Psychology.** A study of abnormal phenomena such as disorders of perception, association, memory, judgment and personality. The psychoses and psychoneuroses will be considered and a brief review of mental deficiency presented. Visits to institutions.

3 lectures or recitations; 3 credits.

**51-a, 52-b, 53-c. Seminar. Special Problems in Psychology.** Credit to be arranged.

**104-a, 105-b, 106-c. Research in Psychology.** Problems of either an experimental or theoretical nature may be pursued. Credit to be arranged.

## GRADUATE SCHOOL

### ENGLISH

ALFRED E. RICHARDS, *Professor*

HAROLD H. SCUDDER, *Professor*

WILLIAM G. HENNESSY, *Associate Professor*

PAUL S. SCHOEDINGER, *Assistant Professor*

CARROLL S. TOWLE, *Assistant Professor*

The candidate for an advanced degree who selects English as his major subject must have a reading knowledge of French and German, or of Latin and German.

#### COURSES FOR ADVANCED UNDERGRADUATE AND GRADUATE STUDENTS

**31-a, 32-b. English Literature of the Restoration.** The period from Dryden to Swift. Special attention will be given to the English social and political life of the period in its connection with the literature. Consideration will be given, also, to the early history of journalism and of English literary criticism. One hour of the week will be devoted to round-table discussion with small groups. (Not given in 1933-34.)

**57-b, 58-c. The English Romantic Movement.** The period from 1780 to 1830, with study of early romantic writers and the causes and characteristics of the movement. Special emphasis is laid upon the poetry of Wordsworth, Coleridge, Byron, Shelley and Keats. One hour of the week will be devoted to round-table discussion with small groups.

3 lectures or recitations; 3 credits.

**59-a, 60-b. The English Novel in the Eighteenth Century.** The novel from Defoe through the Gothic romance.

2 lectures or recitations; 3 credits.

**61-a, 62-b. Milton.** A detailed study of Milton's minor poetry and *Paradise Lost*. Consideration is also given to the social, political and religious history of Milton's day as reflected in his life and poetry.

3 lectures or recitations; 3 credits. No credit is given for only one term's work.

**63-a, 64-b. The English Novel in the Nineteenth Century.** A study of the novel from Jane Austen to Thomas Hardy. (Not given in 1933-34.)

2 lectures or recitations; 3 credits.

## UNIVERSITY OF NEW HAMPSHIRE

**65-b, 66-c. English Literature, from 1600 to 1660.** "Metaphysical" and "Cavalier" poetry, from Donne and Johnson to the Restoration; prose from Bacon to Dryden. The drama and the works of Milton are not included. Assistant Professor Towle.

Elective for Juniors, Seniors, and Graduate students.

3 lectures or recitations; 3 credits.

**67-a, 68-b, 69-c. Shakespeare's Plays.** A study of the principal plays of Shakespeare.

2 lectures or recitations; 3 credits.

**71-c. An Introduction to Drama.** A survey of the field of drama, beginning with the drama of Greece and ending with that of Ibsen. (Not given in 1933-34.)

2 lectures or recitations; 3 credits.

**72-c. Contemporary Drama.** Modern British and Continental drama from Ibsen to the present. Theories, types and developments.

2 lectures or recitations; 3 credits.

**75-a, 76-b. The English Language.** A study of the origin and growth of the English language. First term, Old English; second term, Middle and Modern English.

2 lectures or recitations; 3 credits.

**77-b, 78-c. Chaucer.** A study of Chaucer's life and times, and a reading of his works. First term, his minor poems; second term, *The Canterbury Tales*.

2 lectures or recitations; 3 credits.

### COURSES PRIMARILY FOR GRADUATE STUDENTS

**301-a, 302-b, 303-c. Collateral Reading.** The reading and discussing of selected masterpieces from the literature of the world. A term paper required of each student.

3 lectures or recitations; 4 credits. (Formerly given as 101-a, 102-b, 103-c.)

**304-a, -b, -c. The Faust Story.** A study of the Faust legend as it is found in the literature of Germany and of England. Special attention is given to Marlowe's drama and to the later forms of the legend in English literature.

3 lectures or recitations; 4 credits.

## GRADUATE SCHOOL

### ENTOMOLOGY

W. C. O'KANE, *Professor*

J. G. CONKLIN, *Instructor*

The aim of graduate study in this department is to prepare a student for professional work in one or more of the several specialized divisions of Economic Entomology. Such preparation requires more time and effort than that represented by the four years of undergraduate college work. It assumes that in his undergraduate studies the student has laid a groundwork of general entomology and appropriate related sciences.

The student who wishes to enter graduate work will be expected to present such a foundation, its details depending on the phase of professional entomology in which the student desires to specialize. Related sciences presented may include courses in zoölogy, chemistry, botany, plant pathology, bacteriology, horticulture, or physics, in various combinations. Consultation with the head of the Department of Entomology will determine the prerequisites necessary in a given case.

#### COURSES FOR ADVANCED UNDERGRADUATE AND GRADUATE STUDENTS

Under suitable circumstances graduate credit may be obtained for the following courses, which are open also to undergraduates, provided the permission of the head of the Department of Entomology is secured, and provided that the graduate student completes additional work in these courses and attains superior grades.

**2-a. Insects of Orchard and Garden.** The application of methods of insect control to typical injurious species. Studies in the life histories and habits of important insect pests of orchard, garden and certain field crops.

Prerequisite: Entomology 1-a. 2 lectures; 1 laboratory; 3 credits.

Given in alternate years beginning with 1933-34.

**3-b. Insects of Domestic Animals.** The insect enemies of domestic livestock; the life histories, habits and means of control.

Prerequisite: Entomology 1-a. 2 lectures; 1 laboratory; 3 credits.

Given in alternate years beginning 1932-33.



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**4-c. Household Insects. Medical Entomology.** The life histories, habits and means of control of insects of the household and of stored products. The relation of insects to disease.

2 lectures; 1 laboratory; 3 credits.

**5-a, 6-b, 7-c. Advanced Economic Entomology.** Detailed studies of subjects involved in applied entomology. The literature of economic entomology. Investigational practice. Original studies in the life history and habits of injurious species. Adapted for advanced students.

Required of students specializing in Entomology. Hours and credits to be arranged.

**8-a, 9-b, 10-c. Advanced Economic Entomology.** Continuation of Entomology 5-a, 6-b, 7-c for students who are specializing in the subject.

Required of students specializing in Entomology. Hours and credits to be arranged.

**13-c. Forest Insects.** Studies in the life histories and habits of the more destructive forest insects and the means of their control.

Prerequisite: Entomology 1-a. Elective for others. 2 lectures; 1 laboratory; 3 credits.

### COURSES PRIMARILY FOR GRADUATE STUDENTS

The following courses represent a sequence of studies arranged to include such branches as insect anatomy, insect physiology, details of taxonomy, insect behavior, insect ecology, problems of dispersion, the organization of research, the organization of regulatory measures, and other phases involved in professional entomology. The sequence includes, also, the planning and prosecution of a problem in research, with presentation of the results in the form of a thesis.

**14-a, 15-b, 16-c. Graduate Entomology.**

Prerequisites: Entomology 5-a to 7-c, or the equivalent. Credits and hours to be arranged.

**17-a, 18-b, 19-c. Graduate Entomology.**

Prerequisites: Entomology 5-a to 7-c, or the equivalent. Credits and hours to be arranged.



## GRADUATE SCHOOL

### HISTORY

DONALD C. BABCOCK, *Professor*

ARTHUR W. JONES, *Assistant Professor*

ALLAN B. PARTRIDGE, *Assistant Professor*

PHILIP M. MARSTON, *Assistant Professor*

WILLIAM YALE, *Assistant Professor*

#### Admission to Graduate Study.

1. The completion of 30 credits, or the equivalent thereof, in History, exclusive of History 1-a, 2-b, 3-c, and with an average grade of 75 or better.

2. The understanding that the earning of graduate credit implies

- (a) A "passing grade" of 85 in courses taken in the same class with undergraduates.
- (b) A "passing grade" of 80 in other courses.
- (c) An additional 20% of work to be done as an extra assignment in classes with undergraduates.
- (d) A willingness and a desire to do more than the required minimum, especially as regards collateral reading.

#### Admission to Candidacy.

- 1. Reading knowledge of a foreign language.
- 2. A comprehensive examination in the field of general history.
- 3. Favorable judgment of the head of the department as well as of the Dean of the Graduate School.

**Objectives.** In general, two classes of graduate students may find it profitable to do their major work in this department. The first consists of students who desire a more extended knowledge and a more complete historical background to round out a liberal education, and perhaps to prepare them for the teaching of history. The second consists of those who wish to specialize on some phase of New England history, preferably that of New Hampshire.

**Plan of Work: General Course.** Graduate students in this department will, at the discretion of the head of the department, in-

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clude in their programs, after admission to candidacy, course 1-g, Historic Survey. At some later period they will include 2-g and 3-g, Historic Reading and Theory. Those not specializing in New England history will complete their major work from courses listed in the general catalog. As a rule, no thesis will be written.

**Special Course.** Students specializing in the history of New England will be expected to choose as a subject for the thesis some topic within this field. For this purpose the available facilities for research are considerable, including the libraries of this and other universities, the State Library and the Library of the Historical Society in Concord, and various town records, private documents, unrecorded personal memoirs, landmarks, etc. A part of the work of this department is conceived to be the discovery and conservation of source material existing in the material and mental accumulations of the older type of New England population.

Courses 4-g-9-g inclusive are designed for students of New England history. These courses are not given in class work, and only students especially well prepared will be permitted to follow this line of work.

### COURSES RESTRICTED TO GRADUATE STUDENTS

- 1-g. Historic Survey.
- 2-g, 3-g. Historic Reading and Theory.
- 4-g, 5-g, 6-g. New England History.
- 7-g, 8-g, 9-g. New Hampshire History.
- 10-g, 11-g, 12-g. Thesis.

## HORTICULTURE

GEORGE F. POTTER, *Professor*  
J. RAYMOND HEPLER, *Associate Professor*  
L. PHELPS LATIMER, *Assistant Professor*

Graduate work in Horticulture is offered to students who desire training for professional work, and who have fulfilled the requirements for undergraduate students majoring in Horticulture at this

## GRADUATE SCHOOL

or a similar institution. A reading knowledge of French and German is desirable. The student should also have had sufficient practical experience to enable him to understand and appreciate the problems of Horticulture.

Students will find the department well equipped for fundamental research on horticultural problems.

### COURSES FOR ADVANCED UNDERGRADUATE AND GRADUATE STUDENTS

**5-a. Systematic Survey of Fruits and Vegetables.** A study of the more important species of fruits or vegetables and their botanical relationships.

2 lectures; 2 credits.

**6-b. Advanced Pomology.** A detailed study of fundamental principles and experimental data and their application and relation to orchard problems such as growth and rest period in fruit plants, water requirements, soil management, pruning, fruit bud formation, fruit setting, pollination, thinning, winter injury, and the quality and keeping period of fruits in storage.

3 lectures; 3 credits.

**10-b. Evolution and Improvement of Plants.** The application of the principles of genetics to agricultural plant breeding. Hybridization and selection are studied as means of improving horticultural varieties of plants.

Prerequisite: Zo-ology 32-a. 2 lectures; 2 credits. Given in alternate years beginning 1933-34.

**12-a, 12.5-b. Horticultural Seminar.** A review of the recent horticultural literature and methods of investigational work.

2 lectures; 2 credits.

**14-a, 15-b, 16-c. Advanced Horticulture.** Subject matter to meet the needs of special students or groups of students may be taken by arrangement with the head of the department. Hours and credits to be arranged.

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## COURSES PRIMARILY FOR GRADUATE STUDENTS

**101-b. Problems in Flower Bud Formation.** A discussion of scientific and experimental evidence bearing on flower formation, growth, and composition of fruit plants, alternate bearing of apples, and soil management and fertilization of orchards.

3 lectures; 4 credits.

**102-b. Methods of Horticultural Research.** An examination of methods used in laboratory and field by horticultural investigators.

2 lectures; 2 credits.

**103-a. Problems in Winter Injury.** The physiology of winter injury to fruit plants.

2 lectures; 3 credits.

**104-b. Physiological Problems in Propagation and Growth.** The problems of water relations, rest period, propagation, pruning and thinning of orchard fruits.

3 lectures; 4 credits.

**105-c. Problems in Pollination and Fruit Storage.** The experimental evidence dealing with pollination, fruit setting, color development, and storage of fruits.

2 lectures; 2 credits.

**106-a. Problems in Vegetable Production.** A critical study of the physiological problems involved in vegetable production.

3 lectures; 4 credits.

**125-a. Research in Horticulture.** Credits to be arranged.

## LANGUAGES

CLIFFORD S. PARKER, *Professor*

J. HERBERT MARCEAU, *Associate Professor*

JOHN STEPHEN WALSH, *Associate Professor*

PAUL P. GRIGAUT, *Assistant Professor*

To pursue graduate work in French, an applicant, if a graduate of the University of New Hampshire, must have passed 27 credits

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of undergraduate work in French, and must have demonstrated his fitness for work in the graduate courses offered by this department. If a graduate of another institution, an applicant must show by his record and by his knowledge of French that he is prepared to undertake the work.

### COURSES FOR ADVANCED UNDERGRADUATE AND GRADUATE STUDENTS

#### FRENCH

**16-a, 17-b, 18-c. Romanticism and Realism in French Literature of the Nineteenth Century.** Prose and poetry of the more important writers with lectures, outside reading, written reports, and recitations.

3 recitations; 3 credits.

**19-a, 20-b, 21-c. Recent Tendencies in French Literature.** Studies of the tendencies in French literature from 1870 to the present, in the novel, the theatre, and poetry. Conducted largely in French. Permission of the instructor or of the head of department is required before enrollment.

3 recitations; 4 credits.

**22-a, 23-b, 24-c. French Grammar.** A systematic study of French grammar in all its phases from elementary to highly advanced.

3 recitations; 3 credits.

**40-a, 41-b, 42-c. Survey of French Literature.** A study of French literature from the beginnings to the French Revolution. Lectures, extensive reading, reports, and recitations.

3 lectures or recitations; 3 credits.

### COURSES FOR GRADUATE STUDENTS ONLY

**101-a, 102-b, 103-c. Studies in French Literature of the 16th and 17th Centuries.** This course will take up several of the greatest French writers for a detailed and comprehensive study of their

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work. The choice of writers to be studied in a given year will depend upon the needs or tastes of the students electing the course. The course will be conducted in the form of a seminar.

3 recitations; 4 credits.

### **107-a, 108-b, 109-c. Foreign Influence on French Literature.**

A study of the influences of other countries upon French literature from the Middle Ages to the 19th century. Conducted largely in French.

3 lectures or recitations; 4 credits.

## LATIN

In order that graduate students may minor in Latin, the Department offers each year two courses carrying graduate credit for approved students.

**7-a, 8-b, 9-c. Philosophy and Satire.** A study of the works of Horace and Martial and of Cicero's Tusculan Disputations. Particular attention will be paid to the philosophy, religion, natural sciences, and social theories of the Romans. (Given in alternate years; will be given in 1933-34.)

3 recitations; 3 credits.

**10-a, 11-b, 12-c. Literature and History.** This course offers a comprehensive view of Latin literature of the Golden Age. The works of Cæsar, Cicero, and Virgil will be analyzed for their literary value and historical content. The history of Rome during the Golden Age will be studied in order to provide the background necessary to the student or teacher of the classics. (Given in alternate years; will not be given in 1933-34.)

3 recitations; 3 credits.

**13-a, 14-b, 15-c. Latin Composition and Teaching Methods.** Translation of English narrative, beginning with the fundamentals of grammar and progressing to a study of prose style and effective idiomatic expression. Discussion of the best methods of presenting material to a class.

3 recitations; 3 credits.

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### MATHEMATICS

HERMON L. SLOBIN, *Professor*

WALTER E. WILBUR, *Assistant Professor*

MARVIN R. SOLT, *Assistant Professor*

MILTIADES S. DEMOS, *Assistant Professor*

#### COURSES FOR ADVANCED UNDERGRADUATE AND GRADUATE STUDENTS

**10-a, 11-b, 12-c. Differential Equations and Applications to Engineering Problems.** Professor Slobin.

Prerequisite: Mathematics 9. 3 recitations; 3 credits.

**14-b, 15-c. The History of Mathematics.** This course is designed especially for those preparing to teach mathematics in the high schools. It aims to give an historical background and an appreciation of the development of various fields of mathematics. Assistant Professor Wilbur.

Prerequisite: Mathematics 9. 3 recitations; 3 credits.

**16-a, 17-b, 18-c. Secondary School Mathematics.** A study of the content and the method of teaching secondary school mathematics. Assistant Professor Wilbur.

Prerequisite: Mathematics 3. This course carries graduate credit only for students whose major is Education. 3 recitations; 3 credits.

**30-a, 31-b, 32-c. Advanced Plane and Solid Analytical Geometry.** Assistant Professor Solt.

Prerequisite: Mathematics 9. 3 recitations; 3 credits.

#### COURSES PRIMARILY FOR GRADUATE STUDENTS

**50-a, 51-b, 52-c. Sequences and Series.** An introduction to advanced analysis. Professor Slobin.

Prerequisite: Mathematics 9. 3 recitations; 3 credits.

**60-a, 61-b, 62-c. Selected Topics in the Theory of Functions of a Real Variable.** Professor Slobin.

Prerequisite: Mathematics 9. 3 recitations; 3 credits.

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**70-a, 71-b, 72-c. Selected Topics in the Theory of Functions of a Complex Variable.** Assistant Professor Demos.

Prerequisite: Mathematics 9. 3 recitations; 3 credits.

**80-a, 81-b, 82-c. Advanced Algebra.** The following topics will be treated in this course: matrix theory, including elementary divisors and invariant factors; linear transformations; quadratic, bilinear, and Hermitian forms; invariants and covariants with geometric applications; and topics from the theory of equations, including symmetric functions, and groups of substitutions. Assistant Professor Demos.

Prerequisite: Mathematics 9. 3 recitations; 3 credits.

### SOCIAL STUDIES

A. N. FRENCH, *Professor of Sociology*

H. W. SMITH, *Professor of Economics*

H. F. RUDD, *Professor of Philosophy*

T. V. KALIJARVI, *Associate Professor of Political Science*

A. G. EKDAHL, *Associate Professor of Psychology*

C. W. SWONGER, *Instructor in Economics*

The close relationship of the subject matter of the various departments hereunder included make it advantageous to a strong program of graduate study to group the work under the heading of "Social Studies." Important problems do not of necessity follow departmental lines. A student may wish to study governmental control of business which takes him into the Departments of Economics and Politics. Another may pursue a problem of ethical development which will take him into Philosophy, Psychology or Sociology. Coöperation between allied departments offers decided advantages both in breadth and thoroughness of training. The courses offered below make it possible for the student to concentrate in one or two fields, while at the same time they present him with the opportunity of gaining a broad training in human relations. A student who majors in this work will receive the degree of Master of Arts in Social Studies.

While it is impossible to set up precise qualifications for entering upon work in the field of Social Studies, general standards must be



## GRADUATE SCHOOL

met by the candidate. He should have substantial beginning equivalent to a major in some one or a combination of social subjects, or else be prepared at the recommendation of the Committee of the Social Studies to take basic elementary undergraduate courses without credit. He should also satisfactorily demonstrate to the committee that he has a definite purpose in undertaking graduate work. For the present no student will be encouraged to take more than two year-courses with any instructor.

### ECONOMICS

**34-a, 35-b, 36-c. History of Economics.**

3 credits.

**40-a, 41-b, 42-c. Seminar in Current Economic Problems.**

3 credits.

**13-a, 14-b, 15-c. Money and Banking.**

3 credits.

**23-b. Corporation Finance.**

3 credits.

### PHILOSOPHY

**31-a, 32-b, 33-c. History of Philosophy.**

3 credits.

**41-a, 42-b, 43-c. Logic and Ethics.**

3 credits.

**54-a, 55-b, 56-c. Seminar. Special Problems in Philosophy.**

3 credits.

### POLITICAL SCIENCE

**75-a, 76-b, 77-c. Political Theory.**

3 credits.

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**78-a, 79-b, 80-c. International Relations and World Government.**

3 credits.

**56-a, 57-b. Constitutional Law.**

3 credits.

**58-c. Jurisprudence.**

3 credits.

## PSYCHOLOGY

**47-a, 48-b, 49-c. Psychological, Comparative, and Abnormal Psychology.**

3 credits.

**51-a, 52-b, 53-c. Seminar. Special Problems in Psychology.**

3 credits.

**104-a, 105-b, 106-c. Research in Psychology.**

Credit to be arranged.

## SOCIOLOGY

**17-a, 18-b. Social Psychology.**

3 credits.

**27-a. Criminology.**

3 credits.

**28-b. Urban-Rural Sociology.**

3 credits.

**29-c. Human Relations.**

3 credits.

**26-c. Social Research.**

3 credits.

**50-a, 51-b, 52-c. Seminar. Social Research.**

3 credits.

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### ZOOLOGY

C. F. JACKSON, *Professor*

A. D. JACKSON, *Associate Professor*

E. T. RICHARDSON, *Assistant Professor*

C. E. PACKARD, *Instructor*

The special requirements for graduate work in Zoology include a thorough foundation in the principles of zoology, and the equivalent of 54 credits in this and allied sciences.

#### COURSES FOR ADVANCED UNDERGRADUATE AND GRADUATE STUDENTS

##### **36-a, 37-b, 38-c. Histology.**

3 lectures or recitations; 1 laboratory; 4 credits.

##### **39-a, 40-b, 41-c. Embryology.**

3 lectures or recitations; 1 laboratory; 4 credits.

##### **42-a, 43-b, 44-c. Advanced Physiology.**

3 lectures or recitations; 1 laboratory; 4 credits.

##### **48-a, 49-b, 50-c. Cytology and Genetics.**

3 lectures or recitations; 1 laboratory; 4 credits. (Given in alternate years; not given in 1933-34.)

##### **51-a, 52-b, 53-c. Advanced Neurology.**

3 lectures or recitations; 1 laboratory; 4 credits. (Given in alternate years; given in 1933-34.)

##### **62-s. Comparative Embryology.**

Hours and credits to be arranged.

##### **65-s. Histology.**

Hours and credits to be arranged.

##### **99-s. Special Problems.**

Prerequisite: By special permission. Credits to be arranged.

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## COURSES PRIMARILY FOR GRADUATE STUDENTS

**80-a, 81-b, 82-c. Advanced Taxonomy.** Critical examination of select groups of vertebrates and invertebrates with special reference to local forms, their classification, distribution, and phylogeny.

Prerequisites: Three years' work in Zoology. 2 lectures or recitations; 2 laboratories; 4 credits.

**83-a, 84-b, 85-c. Advanced Comparative Morphology.** A critical and detailed study of the structure and function of aberrant forms and a comparison with the types of the group to which they belong.

Prerequisites: Three years' work in Zoology. 2 lectures or recitations; 2 laboratories; 4 credits.

**86-a, 87-b, 88-c. Advanced Vertebrate Ecology.** A study of advanced ecological problems and their correlation with morphology, physiology, and taxonomy as exemplified by local associations and cenoses.

2 lectures or recitations; 2 laboratories; 4 credits.

**89-a, 90-b, 91-c. Experimental Genetics.** Studies of the effect of hormones, introduced toxins, or drugs on the germ plasm or modification of the offspring when such drugs are given to the parent. The relation of chromosomes to inheritance will be considered experimentally.

Prerequisites: Three years' work in Zoology; including Genetics. 1 lecture or recitation; 3 laboratories; 4 credits.

**92-a, 93-b, 94-c. Comparative Embryology.** A detailed study of the embryonic history of selected types of animals with special emphasis on basic embryological principles.

Prerequisites: Three years' work in Zoology; including Embryology. 3 lectures or recitations; 1 laboratory; 4 credits.

**99-a, -b, -c. Special Problems.** Advanced students may elect this work provided they present a detailed outline of the problems which they wish to investigate and, furthermore, provided they can furnish adequate proof of their ability to carry the problem in view of their past training and the equipment available.

Prerequisites: By special permission. Credits to be arranged.

## GRADUATE STUDENTS

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NAME	COURSE	P. O. ADDRESS
Andersen, Ernest William, B.S. Virginia, 1931	<i>Major: Chemistry</i>	Portsmouth, Va.
Atherton, Harlan Ernest, B.A. Yale, 1925	<i>Major: Education</i>	Wilton
Bowker, Marshall Edward, B.S. New Hampshire, 1931	<i>Major: Mathematics</i> <i>Minor: Physics &amp; E. E.</i>	Kittery, Me.
Brannen, Mildred Evelyn, B.A. New Hampshire, 1929	<i>Major: History</i> <i>Minor: English</i>	Durham
Brisson, Emma Diana, B.A. New Hampshire, 1932	<i>Major: French</i> <i>Minor: English</i>	Newmarket
Brooks, Charles Hussey, B.A. New Hampshire, 1931	<i>Major: Education</i> <i>Minor: History</i>	Dover
Bryant, Floyd Goodwin, B.S. New Hampshire, 1931	<i>Major: Zoölogy</i> <i>Minor: Geology</i>	Tilton
Burkhart, Leland, B.S. Ohio State, 1931	<i>Major: Agr. Bio. Chem.</i> <i>Minor: Botany</i>	Perrysburg, O.
Brown, John Alexander, B.A. Minnesota, 1930	<i>Major: Zoölogy</i> <i>Minor: Geology</i>	St. Paul, Minn.
Bryant, Louis Ralph, B.S. Illinois, 1931	<i>Major: Horticulture</i> <i>Minor: Botany</i>	Durham
Chandler, Roland Francis, B.S. New Hampshire, 1928	<i>Major: Education</i>	No. Attleboro, Mass.
Charron, George Octave Montreal	<i>Major: French</i> <i>Minor: Education</i>	Nashua
Chase, Louise Lowell, B.A. New Hampshire, 1932	<i>Minor: English</i> <i>Minor: German</i>	Manchester
Cheetham, Tom, B.S. New Hampshire, 1931	<i>Major: Education</i>	Nashua
Clark, Warren Clifford, A.B. Dartmouth, 1928	<i>Major: Education</i>	Portsmouth
Creath, Cecil Vernon, B.S. Illinois, 1930	<i>Major: Zoölogy</i> <i>Minor: Botany</i>	Sullivan, Ill.

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NAME	COURSE	P. O. ADDRESS
Currie, Wilsie Austin, B.S. New Hampshire, 1931	<i>Major: English</i>	<i>Durham</i>
Cushing, Merchant LeRoy, B.S. New Hampshire, 1931	<i>Major: Chemistry</i>	<i>Merrimac, Mass.</i>
Cushman, Otis French, B.S. New Hampshire, 1932	<i>Major: Mathematics</i> <i>Minor: Education</i>	<i>Stratham</i>
Davis, Henry Albert, B.S. New Hampshire, 1932	<i>Major: Agr. Bio. Chem.</i>	<i>East Sullivan</i>
Dodge, Ruth-Ellen, B.A. New Hampshire, 1932	<i>Major: English</i> <i>Minor: History</i>	<i>New Boston</i>
Durant, Edward, A.B. Bowdoin, 1928	<i>Major: French</i> <i>Minor: Education</i>	<i>Pepperell, Mass.</i>
Eadie, William Robert, B.S. New Hampshire, 1932	<i>Major: Zoölogy</i> <i>Minor: Agr. Bio. Chem.</i>	<i>Manchester</i>
Ewing, Lyle Wilson, A.B. McCormick, 1906	<i>Major: Education</i> <i>Minor: English</i>	<i>Claremont</i>
Fielding, Thomas, A.B. Boston University, 1932	<i>Major: English</i> <i>Minor: Education</i>	<i>So. Warren, R. I.</i>
Foote, Lewis Ford, B.S. New Hampshire, 1925	<i>Major: Education</i>	<i>Lincoln</i>
Garvin, Carl Hanson, B.S. New Hampshire, 1926	<i>Major: Education</i>	<i>Kingston</i>
Greene, Channing Hildreth, B.S. Middlebury, 1920	<i>Major: Education</i> <i>Minor: History</i>	<i>Southbridge, Mass.</i>
Grover, Muriel Rutledge, A.B. Tufts, 1932	<i>Major: Education</i> <i>Minor: Latin</i>	<i>Dover</i>
Hills, Clarissa, B.S. New Hampshire, 1929	<i>Major: Education</i> <i>Minor: Economics</i>	<i>Johnstown, Pa.</i>
James, Henry Johnson, B.A. Wesleyan, 1924	<i>Major: Education</i> <i>Minor: English</i>	<i>Simsbury, Conn.</i>
Jenkins, Earle Fletcher, B.S. New Hampshire, 1929	<i>Major: Education</i>	<i>Piermont</i>
Lang, Everett Hilton, B.S. New Hampshire, 1932	<i>Major: Chemistry</i> <i>Minor: Agr. Bio. Chem.</i>	<i>Durham</i>
Littlefield, Robert Lincoln, B.S. Maine, 1922	<i>Major: Education</i>	<i>Wells Beach, Maine</i>

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NAME	COURSE	P. O. ADDRESS
Mann, Frederic White, B.S. New Hampshire, 1925	<i>Major: Sociology</i> <i>Minor: Education</i>	<i>East Concord</i>
Mann, Harriet Libby, A.B. Oglethorp, 1927	<i>Major: Sociology</i> <i>Minor: Education</i>	<i>East Concord</i>
Mecheski, Edward Michael, B.S. New Hampshire, 1932	<i>Major: Agr. Bio. Chem.</i> <i>Minor: Botany</i>	<i>Northfield, Mass.</i>
Meserve, Cecille, B.S. in Ed. Boston University, 1931	<i>Major: Education</i> <i>Minor: Sociology</i>	<i>Newbury, Vt.</i>
Monroe, Clyde Wentworth, B.S. R. I. State, 1931	<i>Major: Zoölogy</i> <i>Minor: Geology</i>	<i>Dover</i>
Moran, Phyllis Marguerite, A.B. New Hampshire, 1930	<i>Major: Education</i>	<i>Somersworth</i>
Muzzey, George Aldrich, A.B. University of Maine, 1925	<i>Major: Education</i>	<i>Fairfield, Maine</i>
Nudd, Philip, B.S. New Hampshire, 1930	<i>Major: Mathematics</i> <i>Minor: Education</i>	<i>Hampton</i>
Osgood, Jonathan, B.S. New Hampshire, 1932	<i>Major: Education</i>	<i>Pittsfield</i>
Paradis, Doris Viola, B.A. New Hampshire, 1930	<i>Major: French</i> <i>Minor: German</i>	<i>Somersworth</i>
Parker, Ralph Harthan, B.A. New Hampshire, 1917	<i>Major: Education</i>	<i>Exeter</i>
Partridge, Eva Small, B.A. New Hampshire, 1925	<i>Major: Education</i>	<i>Newfields</i>
Perkins, Donald Merrill, B.S. New Hampshire, 1931	<i>Major: Mathematics</i> <i>Minor: Physics</i>	<i>Sunapee</i>
Pitz, Donald Rettinghouse, B.S. New Hampshire	<i>Major: Chemistry</i>	<i>Durham</i>
Pride, Eva Sweetser, B.A. University of Maine, 1924	<i>Major: Zoölogy</i> <i>Minor: Botany</i>	<i>Portland, Maine</i>
Redden, Anna Josephine, B.A. New Hampshire, 1932	<i>Major: French</i> <i>Minor: Education</i>	<i>Dover</i>
Riley, Matthew Howard, B.S. New Hampshire, 1931	<i>Major: Mathematics</i> <i>Minor: Education</i>	<i>Somersworth</i>
Robinson, Francis Edwin, B. A. New Hampshire, 1931	<i>Major: English</i> <i>Minor: History</i>	<i>Durham</i>

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NAME	COURSE	P. O. ADDRESS
Roe, Henrietta R., B.S. in Ed. Trenton State Teachers College, 1930	<i>Major: Education</i> <i>Minor: History</i>	<i>Dover</i>
Sewell, Dorothy Augusta, B.A. New Hampshire, 1930	<i>Major: French</i> <i>Minor: English</i>	<i>Dover</i>
Smith, Owen Jefferson, B.S. Iowa Wesleyan, 1932	<i>Major: Entomology</i> <i>Minor: Zoo. &amp; Chem.</i>	<i>Albia, Iowa</i>
Spalding, Willard Benjamin, B.B.A. Boston University, 1926	<i>Major: Education</i>	<i>Norwell, Mass.</i>
Swain, Vernon Trickey, B.S. New Hampshire, 1932	<i>Major: Education</i>	<i>Barrington</i>
Taylor, Alfred Henry, 3d, B.S. New Hampshire, 1930	<i>Major: Chemistry</i> <i>Minor: Agr. Bio. Chem.</i>	<i>Pearl River, N. Y.</i>
Tebbetts, Lucy Mable, B.S. Boston University, 1928	<i>Major: French</i> <i>Minor: Spanish</i>	<i>Berwick, Maine</i>
Temple, George Franklin, B.S. M. I. T., 1930	<i>Major: Chemistry</i>	<i>Somersworth</i>
Thayer, Gordon Oliver, B.A. New Hampshire, 1932	<i>Major: Education</i> <i>Minor: History</i>	<i>Dover</i>
Thomas, Naomi Williams, B.A. University of Richmond, 1929	<i>Major: History</i> <i>Minor: Education</i>	<i>Durham</i>
Washburn, Lloyd Eugene, B.S. Penn. State, 1931	<i>Major: Agr. Bio. Chem.</i> <i>Minor: Zoölogy</i>	<i>Roaring Branch Pa.</i>
Wheelock, Howard Ellis, B. A. New Hampshire, 1932	<i>Major: Education</i> <i>Minor: History</i>	<i>Keene</i>
Wells, Lloyd Leslie, B.S. New Hampshire, 1933	<i>Major: Zoölogy</i> <i>Minor: Chemistry</i>	<i>Woodsville</i>
Woods, Wadleigh Winston, A.B. Dartmouth, 1927	<i>Major: Education</i>	<i>Portsmouth</i>
Young, Edna Susan, B.S. New Hampshire, 1931	<i>Major: Education</i>	<i>Ossipee</i>









